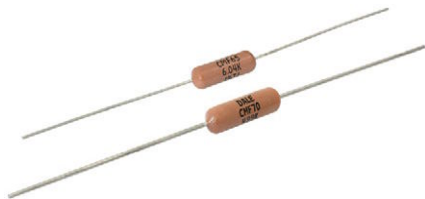




## Metal Film Resistors, Axial, Industrial, Pulse Withstanding Protective



## MATERIAL SPECIFICATIONS

Element	Vacuum-deposited nickel-chrome alloy
Core	Fire-cleaned high purity ceramic
Coating	Flame retardant epoxy, with flameproof undercoat; formulated for higher power, with superior moisture and mechanical protection
Solderability	Continuous satisfactory coverage when tested in accordance with MIL-R-10509

## FEATURES

- Special Vishay Dale design provides lightning withstand characteristics along with resistor functionality
- Provides lightning surge absorption capabilities
- Protect against a variety of electrical hazards which can change or destroy sensitive electronic equipment including high energy voltage surges caused by power line anomalies (direct power crosses or inductively coupled effects) and other momentary over voltages
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS\* Available

## Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

## STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING <sup>(1)</sup> $P_{25^{\circ}\text{C}}$ W	POWER RATING <sup>(1)</sup> $P_{70^{\circ}\text{C}}$ W	POWER RATING <sup>(1)</sup> $P_{125^{\circ}\text{C}}$ W	MAXIMUM WORKING VOLTAGE V	RESISTANCE RANGE <sup>(2)</sup> $\Omega$	TOLERANCE $\pm$ %	TEMPERATURE COEFFICIENT $\pm$ ppm/ $^{\circ}\text{C}$
CMF65..147	2.5	1.75	1.25	500	1 to 15M	1, 2, 5	100
CMF70..147	3	2	1.5	500	1 to 15M	1, 2, 5	100

## Notes

(1) Continuous working voltage shall be  $\sqrt{P \times R}$  or maximum working voltage, whichever is less.

(2) Pulse withstanding capabilities are value dependent, and are most effective in values greater than 200  $\Omega$ .

## TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CMF65...147	CMF70...147
Maximum Working Voltage	$V_{\text{W}}$	$\leq 500$	
Insulation Voltage (1 min)	$V_{\text{eff}}$	$> 500$	
Voltage Coefficient (Max.)	ppm/V	$\pm 5$ (measured between 10 % and full rated voltage)	
Dielectric Strength	$V_{\text{AC}}$	900	
Insulation Resistance	$\Omega$	$\geq 10^{11}$	
Operating Temperature Range	$^{\circ}\text{C}$	$-55$ to $+175$	
Terminal Strength (Pull test)	lb	2	5
Noise	dB	0.10 $\mu\text{V/V}$ over a decade of frequency, with low and intermediate resistance values typically below 0.5 $\mu\text{V/V}$	
Weight (Max.)	g	1.20	1.30

## GLOBAL PART NUMBER INFORMATION

Global Part Numbering: CMF701K0000FKCP147 (preferred part numbering format)

C	M	F	7	0	1	K	0	0	0	0	F	K	C	P	1	4	7
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GLOBAL MODEL

CMF65  
CMF70

RESISTANCE VALUE

$R = \Omega$   
 $K = \text{k}\Omega$   
 $M = \text{M}\Omega$   
 $10R000 = 10 \Omega$   
 $1K3300 = 1.33 \text{ k}\Omega$   
 $1M0000 = 1.0 \text{ M}\Omega$

TOLERANCE CODE

$F = \pm 1 \%$   
 $G = \pm 2 \%$   
 $J = \pm 5 \%$

TEMP. COEFFICIENT

K = 100 ppm

PACKAGING

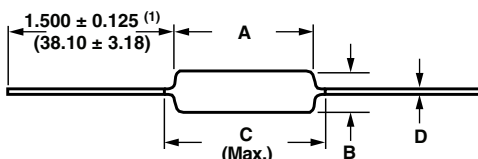
$EK$  = lead (Pb)-free, bulk  
 $EA$  = lead (Pb)-free, T/R (1000 pieces)  
 $BF$  = tin/lead, bulk  
 $CP$  = tin/lead, T/R (1000 pieces)

SPECIAL

(Dash number)  
**147** = pulse withstanding

## Note

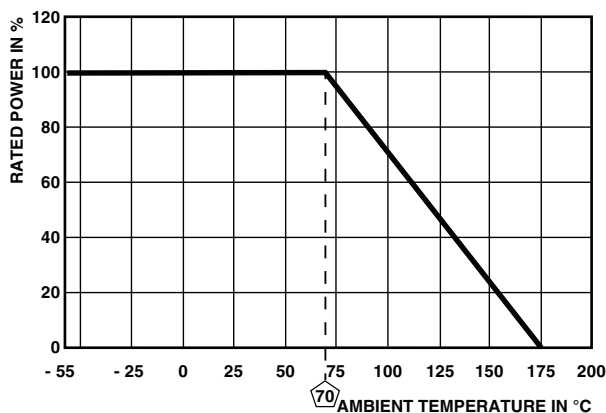
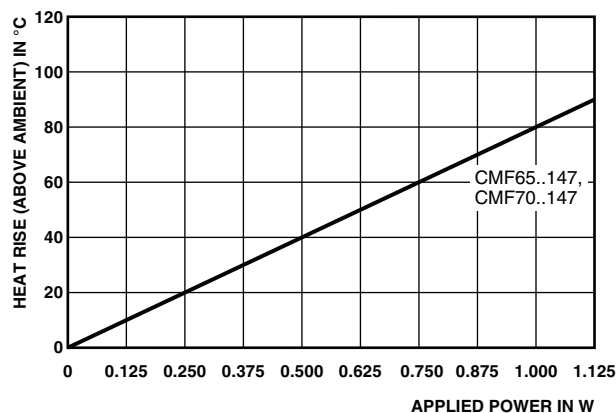
- For additional information on packaging, refer to the Through Hole Resistor Packaging document ([www.vishay.com/doc?31544](http://www.vishay.com/doc?31544)).

**DIMENSIONS** in inches (millimeters)

GLOBAL MODEL	A	B	C (Max.)	D
CMF65..147	0.562 ± 0.031 (14.27 ± 0.79)	0.215 ± 0.015 (5.46 ± 0.38)	0.687 (17.45)	0.025 ± 0.002 (0.64 ± 0.05)
CMF70..147	0.562 ± 0.031 (14.27 ± 0.79)	0.230 ± 0.015 (5.84 ± 0.38)	0.687 (17.45)	0.032 ± 0.002 (0.81 ± 0.05)

**Note**

(1) Lead length for product in bulk pack. For product supplied in tape and reel, the actual lead length would be based on body size, tape spacing, and lead trim.

**DERATING****THERMAL RESISTANCE****PERFORMANCE**

TEST (TEST METHODS - MIL-STD-202)	AT +70 °C	AT +125 °C
	MAXIMUM ΔR (TYPICAL TEST LOTS)	
Short Time Overload	± 0.05 %	± 0.05 %
Low Temperature Operation	± 0.05 %	± 0.05 %
Moisture Resistance	± 0.05 %	± 0.05 %
Shock	± 0.01 %	± 0.01 %
Vibration	± 0.04 %	± 0.04 %
Temperature Cycling	± 0.15 %	± 0.15 %
Load Life	± 1.0 %	± 1.0 %
Dielectric Withstanding Voltage	± 0.01 %	± 0.01 %
Effect of Solder	± 0.03 %	± 0.03 %

**MARKING**

CMF65-147, CMF70-147: (5 lines):

DALE Manufacturer

C70-147 Model (C65-147 = CMF65-147, C70-147 = CMF70-147)

24.3KΩ Value

1% T1 Tolerance and TC (T1 = 100 ppm)

1309 4-digit date code

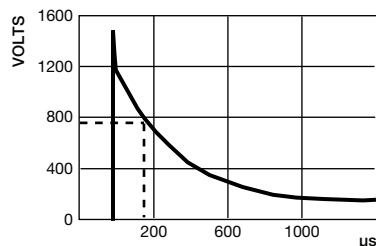


## LIGHTNING PULSE WAVE FORMS

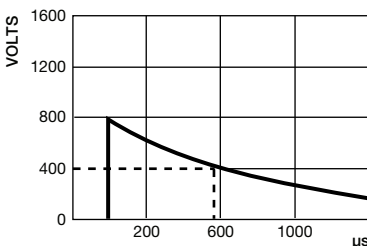
Lightning pulse wave forms are defined by three numbers:

- Maximum time to reach peak voltage level (typically 10  $\mu$ s)
- Minimum time for voltage to decrease to half value
- The peak voltage level

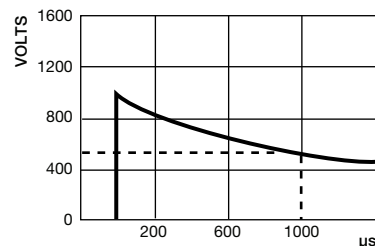
Three examples are shown below.



10 by 160  $\mu$ s up to 1500 V FCC - Longitudinal Surge

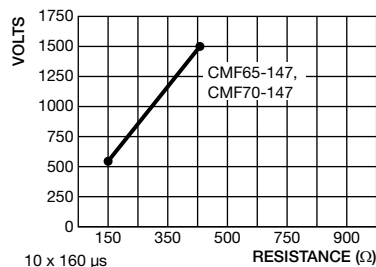


10 by 560  $\mu$ s up to 800 V FCC - Metallic Surge

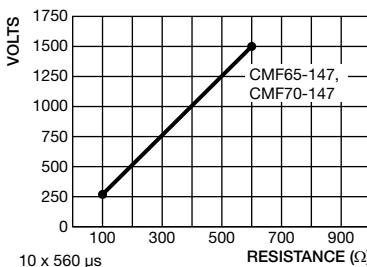


10 by 1000  $\mu$ s up to 1000 V REA - Current Surge

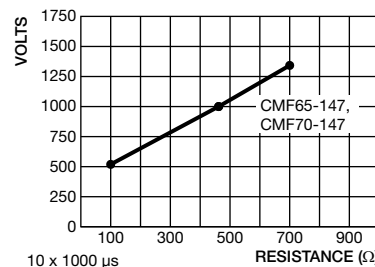
These graphs show the relationship value and pulse withstanding voltage for CMF-65-147 and CMF-70-147 using a 1.0 % resistance shift after 10 pulses as the figure of merit. The stable operating region of each package is on the right side of the appropriate line. Pulse withstanding capabilities are value dependent, and are most effective in values greater than 200  $\Omega$ .



10 x 160  $\mu$ s



10 x 560  $\mu$ s



10 x 1000  $\mu$ s



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